MORTALITY

OF THE

BRITISH ARMY,

AT HOME, AT HOME AND ABROAD, AND DURING THE RUSSIAN WAR,

AS COMPARED WITH THE

MORTALITY OF THE CIVIL POPULATION IN ENGLAND.

Illustrated by Tables and Diagrams.

[Reprinted from the Report of the Royal Commission appointed to enquire into the Regulations affecting the Sanitary State of the Army.]

LONDON:

PRINTED BY HARRISON AND SONS, ST. MARTIN'S LANE,

1858.

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MORTALITY OF THE BRITISH ARMY, AT HOME, AT HOME AND ABROAD, AND DURING THE RUSSIAN WAR, AS COMPARED WITH THE MORTALITY OF THE CIVIL POPULATION IN ENGLAND. LONDON, 1858.

THIS ANONYMOUS PAMPHLET WAS ONE OF THE EARLIEST INSTANCES OF THE PRESENTATION OF STATISTICAL FACTS BY MEANS OF PICTORIAL CHARTS, INDEED FLORENCE NIGHTINGALE BELIEVED SHE HAD INVENTED THIS METHOD. UNWELCOME FACTS, SUCH AS THE MORTALITY IN BARRACKS BEING DOUBLE THAT OF CIVIL LIFE, WERE DRIVEN HOME AT A GLANCE BY MEANS OF COLORED CIRCLES AND WEDGES.

THE PAMPHLET WAS PUBLISHED AS PART OF THE REFORMERS' DELIBERATE USE OF PUBLIC OPINION TO PRESSURE THE WAR MINISTRY INTO IMPLEMENTING NEEDED CHANGES.

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From the difficulty of introducing a sheet, of sufficient size, to represent such a Mortality into the folio, this figure has been projected on a tenth part of the scale of the other figures in the Diagram. Had it been on the same scale the longest Radius, representing the Mortality in the Hospitals for Februay 1855, would have projected 40 inches from the centre of the circle!

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Description of Diagrams of the Mortality in the British Army.

DIAGRAMS are of great utility for illustrating certain questions of vital statistics by conveying ideas on the subject through the eye, which cannot be so readily grasped when contained in figures. This aid has therefore been called in to give greater clearness to the numerical results in the body of the Report and in the Appendix.

Diagrams have been prepared illustrative of the comparative health of men of the army ages in England and of soldiers in Barracks on Home Stations.

Likewise diagrams showing the same comparison for the whole army at home and abroad.

These several diagrams give the comparison of the life of the soldier with the life of the civilian at the same ages in time of peace.

There is another set of diagrams showing the same comparison in time of war.

Two other diagrams exhibit the chief classes of disease in both sets of diagrams. We are thus enabled better to understand how far it is within the power of preventive science to diminish the risks to which the soldier is exposed, whether at home or in the field.

Diagram A shows the relative mortality of the Foot Guards and of the English male population at the corresponding ages.

Diagram A. Table A & B.

It must be remembered that the Guards are, physically, the very select out of the population. Any impediment or disease is enough to prevent a man being taken for military service. And none but the strongest and best looking recruits are accepted by the Guards. The young Guardsman is, in every sense, a "picked" life, and would be considered as a first-class life by any insurance office.

As soon as the recruit enters the service he is placed under the entire control of educated officers: his diet, cleanliness, personal habits are strictly attended to: he is lodged in barracks which have cost the country far more than was the relative cost of the house in which he was brought up: he never leaves the country in time of peace, but passes from his town-quarters in London to his country-quarters at Windsor or at Chichester, and whenever he suffers from the slightest ailment his medical adviser is instantly beside him: he has hospital accommodation, medicine, attendance, and every necessary comfort immediately.

One would say that of all men a soldier in Her Majesty's Guards was the most likely to enjoy perfect health and long life.

The men that were rejected when the Guardsman was selected have passed back into civil life. The civil population has lost a certain proportion of its good life which has gone into the army, and it has received back those lives which were not good enough for the army. The civil population has had all the loss, the army all the gain.

Let us now see how the Guards die off under the, apparently, very favourable circumstances mentioned.

Diagram A consists of alternate black and red lines of different lengths. The black lines show the proportion of deaths per annum among 1,000 of the civil population for each 5 years from 20 to 40. The red lines show the proportion of deaths per annum among 1,000 Guards for the same ages. The excess in length of the red line over the black line in each pair of lines shews the excess of deaths among the Guards. There is however an important difference between the relative value of the black and red lines which must be noticed, otherwise the mortality in the Guards, great as it is, might appear less than it really is. The black line exhibits all the deaths in the civil population which occur between the ages of 20 and 40, but the red line does not exhibit all the deaths which occur *among the men who had been selected for the Guards*. Every year between the ages of 20 and 40, men are rendered unfit for service by organic disease, and are discharged to die among the civil population and to raise its rate of

mortality. These are included in the black line, and are consequently not shown in the red line. These deaths are in fact deducted from the length of the red line and added to the length of the black line, so that in the comparison the Guards have a double advantage from their men who die invalided.

The Guards, though the most unhealthy corps in the home service, is not the only one which suffers a great excess of mortality. All the army on home service suffers, though in a somewhat less proportion.

Diagram B. Table A & B. This is shown in Diagram B, where the black lines again exhibit the mortality among the general English population, and the red lines the mortality among soldiers on home service. The excess of length in the red lines shows the excess of mortality among the troops, subject to the same correction as to invaliding as has been already mentioned for the Guards.

The whole army, like the Guards, consists of carefully picked lives. To show the full bearing of this fact in any comparison between the health of the army and that of civilians, it is necessary to state that, of the civil population at the recruiting age, a certain part is unable from illness to present itself to the recruiting officer: that deaths among that part go to raise the civilian mortality: that of those who do present themselves for recruits, a third part at least, though probably a much larger proportion, are rejected as unfit for service: that of those rejected at least a fourth part are suffering from diseases which shorten life. The lives rejected are thrown back into the general population; but notwithstanding this process of selection and the apparently favourable circumstances under which the troops are placed, we have from some cause or other the extraordinary results exhibited by these diagrams.

Diagram C. Tables C—*a*, C—*b*. The wide extent of the British Empire, and the great variety of climates it presents, as well as the topographical peculiarities of our various colonies and possessions scattered over the whole earth, would lead us to expect a higher rate of mortality among soldiers born in the British Islands, when these soldiers are sent on service abroad, than would exist among the home population at the same ages.

This difference is represented in Diagram C, which exhibits the mortality among Englishmen of the army ages, living in healthy districts, and the mortality of the whole army at home and abroad for the same period, subject to the same correction for invaliding.

Diagram D. Tables C—*a*, D. Diagram D shows the same fact with regard to the army and the general male population of England at the army ages.

In some years it will be found that the mortality in the troops is from 5 to 6 times greater than it is in civil life, as represented on Diagram C.

Diagram E. Tables E—*a*, E—*b*. These facts are represented in another way in Diagram E, each parallelogram of which represents the total sum of life among 10,000 men, between 20 and 40 years of age, entering the army, and remaining on home-service, and among the same number of Englishmen taken, first, all over the town and country districts, and, secondly, in the healthy districts at home at the same ages. The left-hand line of each parallelogram shows that all start alike; but the black wedge, which represents the progress of death among the various classes, it will be observed, has a very different slope in each separate parallelogram.

The proportion of death increases and that of life diminishes, in a very different ratio and to a very different extent in each.

The mortality is greater and its progress more rapid among the English male population generally than among that in healthy districts.

The general population has lost a third more by the time it arrives at the age of 40, than the healthy population has, while the soldiers have lost above a third more of their numbers than the general population, and more than twice as many as the healthy population.

Each parallelogram also represents the total money value of 10,000 men between the ages of 20 and 40, as well as the loss of value from loss of life at each succeeding year between the two ages. It further shows the relative value of the amount of life in the army as contrasted with that of two classes of civil population, passing on from 40 years to the succeeding period of life, from which it will be seen that while among healthy civil populations about 8,500 lives out of 10,000 survive the wear and tear of the ages between 20 and 40, and thereafter add their quota to the wealth of the community, only 6,900 of the army lives are available for the same purpose.

It may be said that the nation loses the money value of the excess of mortality existing in its general population over that of the population in healthy districts.

In the case of the army, the country incurs great expense in educating the soldier for his duties, and it is difficult to estimate the value of a good soldier, for he can hardly be replaced. In the present state of sanitary knowledge, it may be fairly stated that the whole excess of money loss between that in healthy districts and that in the army, as represented by the difference in area of the black wedges, might be saved to the tax-payers of the country.

The general community incurs a still further loss of productive labour, because it will be seen that the number of lives at 40 years of age returned into the general civil population (supposing that the average age of discharge from service is 40 years), is much smaller in the army than the proportion which survives in the healthy civil population: and the productive power of the country is further taxed for the support, by poor-rates and otherwise, of a large proportion of men, temporarily or permanently disabled by diseases contracted in the service.

Diagram F. Tables F—*a*, F—*b*, F—*c*, F—*d*. The loss from invaliding has been already referred to as a serious cause of inefficiency in the army not shown in any of the preceding diagrams. Diagram F has been constructed from Tables F—*a*, F—*b*, F—*c*, and F—*d*, to bring under one view the whole loss sustained. This is shown in No. I., on which the black wedge represents the deaths, the yellow wedge the loss from invaliding, and the two wedges conjoined the total loss from both causes in an army of 200,000 men between the ages of 20 and 40. No. II. represents what the loss would be if the army were as healthy as the civil male population, and by comparing the red areas of both diagrams the great loss of efficiency in the army in its present state becomes more apparent. Under the present system No. 1, 10,000 annual recruits would be required to sustain a force of 141,764 men, while under the improved conditions as to health indicated on No. II, 10,000 annual recruits would sustain an army of 166,910 men.

These diagrams then show the loss of life, of service, and of money value entailed on the country by the neglect of sanitary measures in the army in time of peace.

Diagram G. Table G. It is in the highest degree important to show the classes of disease from which the great losses in the army in time of peace arise, for it is in this way alone that we can ascertain whether, and to what extent, we can mitigate or prevent these diseases by known sanitary precautions.

The two parallelograms on Diagram G represent the classes of mortality from disease most prevalent in the Infantry on home-stations, as compared with the extent of the same types of disease in civil life at the same ages.

The excess of length in the army parallelogram shows the total excess of mortality in the Infantry over that in the civil population.

We are at once struck by the remarkable fact that more than seven-ninths of the mortality in the Infantry are due to two classes of disease alone,—namely, to zymotic diseases, such as fevers, cholera, diarrhœa, and to chest and tubercular diseases, such as consumption, &c.

In fact the mortality from chest and tubercular diseases alone, in the Infantry on home service, exceeds the total mortality from all causes among the civil population at the same ages; while the deaths from zymotic disease are above double what they are in civil life. Again, chest and tubercular affections are the scourge of the civil population, and yet the civil population suffers less than one-half the mortality from these diseases that occurs in the Infantry, while the deaths from zymotic disease in the Infantry nearly equal the total deaths from chest affections in the civil population. It is necessary here also to repeat that while the area in diagram G representing the mortality of the English male population exhibits all the deaths from each class of diseases, the area representing the Infantry mortality does not. It takes no account of men discharged by reason of chronic, tubercular, and chest diseases, whose deaths taking place after discharge among the civil population, go to swell the mortality from these diseases, such as it is shown in the area which represents the civilian mortality.

These diagrams, then, exhibit clearly the frightful mortality continually going on in the British army, and the classes of disease to which this mortality is to be attributed.

The first question which arises on looking at these diagrams is,—what can be the cause of all this? By what possible procedure can it be that the élite of the British working population can be so guided as that such a result shall follow? Is there anything in the food, clothing, duties, habits of the men to which it can be attributed? Are the army medical men less skilful in their profession than those in civil life? To every such query we must reply that there is, on the contrary, everything in the soldier's favour in these particulars, except perhaps that he is not sufficiently worked. His barrack accommodation has cost the country enough of money. There has been no expense spared in that. Can there be anything there to occasion such fearful annual loss of life?

Let us see what sanitary experience teaches as to the causation of the diseases from which the soldier suffers.

1st. *Consumption and diseases of that class* are the result of breathing foul air contaminated by the breath of other persons. It is air polluted in this way which appears to be the special agent which predisposes people to consumptive diseases. How is such a state of the air chiefly produced? Very easily:—simply by crowding too many people into unventilated rooms, especially into sleeping-rooms.

If barrack-rooms are crowded and unventilated, and if the atmosphere is close or foul during the hours of sleep when the system is more peculiarly predisposed to its effects, then you

have the elements of consumption and tubercular disease. If you want to develop the seeds into activity, all you have to do is to take the men out of such an atmosphere which they have been breathing night after night, and expose them on guard to wet and cold, and the disease will soon develop itself.

But mark,—exposure to wet and cold alone will not do it. The Crimean experience proved this ; and so it is found to be daily and nightly, in night trades and occupations, except in the case of the soldier.

To know whether the conditions requisite to produce consumption and tubercular disease exist in barracks, it is only necessary to read the disgusting evidence given before the Barrack Committee, and the statements in this Report on the subject, or simply to consult the tables in the Appendix showing the amount of cubic space allowed to the men in barracks, and to the sick in military hospitals. It would be difficult to frame conditions more likely to generate such diseases than those to which soldiers are exposed in barrack-rooms. They are in fact the self-same conditions as have been determined by direct experiment to be necessary for the production of tubercular disease in animals.

When a sufficient cause is found it is not necessary to look for another.

2nd. *Zymotic diseases*, namely, *fevers, diarrhœa, cholera, dysentery*, &c., are known in civil life to be most intense in their activity where certain local conditions are present—

First in prominence amongst these conditions, we have again overcrowding and defective ventilation,—the repeated breathing, in fact, of air already breathed, such air being further contaminated by moisture and exhalations from the skin.

Next we have emanations proceeding from animal excretions, or from decaying vegetable matter together with moisture. The want of drainage and the foul state of the latrines and urinals in many barracks, as described in the Report, are sufficient illustrations of this class of causes.

There are others of minor importance which need not be mentioned. Those enumerated are quite sufficient to account for most of the excess of zymotic mortality from which the army on home-stations suffers. If men returning from foreign service happen occasionally to be more susceptible to the operation of such causes, they will of course suffer more severely ; but allowance is made in the diagrams for even this contingency, as they do not exhibit any deaths occurring for the first six months after men have returned from foreign service.

The next query is one which it is almost superfluous to put. It is whether there be any known means of diminishing this excessive mortality ; and whether there be any hope of reducing the lines of disease and mortality among the troops, as exhibited in these diagrams, to the same length as the lines for the civil population ?

The reply is, that the line of the soldier's mortality on home service should, to say the least of it, never have been longer than that of the civil population, and that it might be shorter. The parallelogram showing the mortality and disease among the civil population on Diagram G, is the very one, towards the reduction of which to smaller dimensions the whole sanitary procedure under every sanitary Act of Parliament is directed. It was the large dimensions of such parallelograms that led to the agitation which ended in the Legislature giving a sanitary code to England. And it is hardly credible that it should be necessary at the present day to advocate similar measures for the army.

There is no reason why with proper sanitary measures the general health of the population should not be raised to the standard of the most healthy districts of the country, as indeed it has been in certain marked instances. And why should the health of the army on home service be any exception, seeing that the personal conditions of the soldier are so much more favourable ? If this were done, and if our home army consisted of 100,000 Guards, we should save nearly 1,500 good soldiers per annum, who from all experience in other cases are as certainly killed by the neglects specified as if they were drawn out and shot.

By referring back to Diagrams C & D, which represent the army mortality at home and abroad, as compared with that of an English population at the same ages, we cannot fail to be struck with the immense loss of life entailed on the army, and the corresponding cost to the country from foreign service. This loss is much less than it was in former times. It has been diminished by various sanitary means ; and there is no reason whatever, why, if intelligent inquiry were instituted, and proper sanitary precautions taken, all the lines of army mortality on those melancholy tables might not be materially shortened.

Unfavourable as those diagrams are to the sanitary system, or rather want of system, in the British army, they exhibit results which might be considered as in the highest degree favourable when contrasted with the mortality from disease among the British troops in time of war.

It is at such times that the excessively defective state of sanitary science and practice in the army becomes pre-eminently remarkable, and leads to the most disastrous results. It is right, however, to state that such defects are not confined to the British army. All armies during war have suffered from the neglect of very ordinary hygienic precautions, and some

armies have been all but destroyed in consequence Nearly six-sevenths of the vast army with which Napoleon the First invaded Russia had perished, or ceased to be effective before the setting in of the fierce cold which destroyed the remainder.

The actual losses in battle form a very small part of the calamities of a long war, so much so that if the excess of mortality caused by disease could be cut off, the loss in action would be hardly worthy of remark in the comparison.

The facts connected with the disastrous Walcheren expedition, as well as the ignorance and absence of the most ordinary precautions which led to so great a loss of life, are matters of history. But up to the present time the experience of that expedition appears to have led to no beneficial result, so far at least as can be gathered from the still more disastrous Crimean war.

The linear Diagram H gives the comparative results of the mortality amongst the English male population of the army ages, and amongst the soldiers of the British army in the East. The first short black line gives the mortality from all causes among the English population. The second long red line, nearly twenty-three times the length, gives the mortality in the army. For every Englishman of the army ages who died at home, nearly twenty-three died in the East. The proportion of deaths from wounds, exclusive of those killed on the field, during the war, was thirty times greater among the soldiers than among the civil population ; but even at that rate the mortality in hospital from wounds did not exceed 3 per cent. of the force, while the deaths from all causes were nearly 23 per cent. of the force in the field. Diagram H. Tables H—*a*, H—*b*.

When we examine the cause of this great mortality, the eye is arrested at once by the second long red line marking the zymotic deaths. The short black line immediately above it shows the corresponding mortality from zymotic diseases among the home male population at the same ages.

We learn from these two most instructive lines, that for every man of the ages and numbers who died at home from zymotic maladies, 93 died in the army in the East! The remaining diseases shown in the diagram are not worth notice. If they were all expunged, and the deaths from wounds taking place in hospital expunged with them, the fact would remain that the army in the Crimea almost perished from zymotic disease.

The awful mortality in that noble army is shown still more strikingly by Diagram I. For the sake of comparison, the town of Manchester, one of the most unhealthy in England, and one very subject to zymotic diseases, has been selected. The small black disc in the centre shows what would have been the mortality of the Crimean army, had it had been as healthy as Manchester. Now contrast with this the great black bat's wing on the right-hand of the diagram. The whole of that black area outside the small innermost circle shows the excess of mortality in the army over that of one of the most unhealthy towns in England. Diagram I.

The diagram is in two parts. The right hand part shews the mortality of the army during the first twelve months of the War from April 1, 1854, to March 31, 1855.

It shows how healthy the army was when it landed in the East. By comparing the dates, it will be seen that, immediately on the army reaching Varna, sickness and death began to increase, showing the sudden exposure of the troops to some very unusual causes of mortality. It will be seen, that the whole time the army was in Bulgaria, it suffered severely—that the mortality declined when it left that pestiferous region for the Crimea—that from the moment it broke ground before Sebastopol, in a comparatively healthy district of country, the mortality began to rise during October—that it progressed with frightful rapidity during November and December, attaining, during January 1855, an amount greater than the maximum of the mortality of the great plague of London in September 1665.

The diagram gives a pictorial representation of that great Crimean calamity during the first year of the war. Except, perhaps, in one or two of the mediæval epidemics, no pestilence of which we have any record would form such a picture for eight consecutive months.

The left-hand diagram gives the mortality of the second year of the war. It was great, as will be seen by contrasting its black irregular surface with the small Manchester circle, but when compared with the first year's mortality it is insignificant. It will be seen that for the last three months (but in reality for the last six months, January to June 1856 inclusive) the mortality retires within the Manchester circle and all but disappears. We have here at a glance the vital statistics of the Crimean war.

The immense preponderance of zymotic diseases has been already referred to, and a glance at Diagram K will show that these diseases were the cause of the whole catastrophe. The total mortality from wounds at Alma, Inkermann, and during five months in the trenches, exclusive of the killed in action, is all comprised in the small pink cone in the centre. The small black patch adjacent comprehends the total mortality from diseases not zymotic. The irregular blue surface, like the tail of a portentous comet, shows the zymotic diseases, the pests and scourges of camps and armies now, as they were of cities and towns in the middle ages, before the dawn of sanitary knowledge. Diagram K. Table K, fig. 1.

The analysis of the second year's mortality is given on the left-hand circle of Diagram H. It exhibits an immense reduction in the deaths from all causes except from wounds, the legitimate result of war; but even to the end the zymotic mortality retains its preponderance, and only disappears when the army had arrived at its most healthy condition.

On comparing the total mortality as shown on Diagram I. with the zymotic mortality in Diagram K., it will be seen that the very first diseases from which the army suffered (as shown by the dates) in Bulgaria were zymotic diseases. They were principally fever and cholera, brought on by neglect of sanitary precautions chiefly in the first bad selection of camp sites. The first outbreak began to subside only in September, and continued to decline until the army sate down before Sebastopol. Another and far more terrible invasion of zymotic disease followed that event.

The men were hard worked, but hard work by itself never induced zymotic disease. We must look for other causes, and these causes once existing, fatigue would co-operate powerfully with them. The men had no sufficient shelter. They were in want of clothing suitable to the weather. They suffered from wet and damp. They were exposed to the elements at all times and seasons. Their food was not sufficiently nutritious nor varied. They had no proper means of cooking, and little or no fuel, and they could not eat their rations. What wonder, then, if their very blood got into a disordered state, and zymotic maladies broke out among them? Scurvy and scorbutic diseases appeared at a very early period. Fever, cholera, diarrhœa, dysentery increased, so as to threaten the total destruction of the force. The requirements of hygiène had been disregarded, and these diagrams show the natural results.

During the summer of 1855, as shown on the left-hand diagram, zymotic diseases still prevailed, though to a comparatively insignificant degree. Sanitary defects in draining, cleansing, and ventilation, and over-crowding were then the prevailing causes of attacks. During the winter of 1855—56 all the previous causes of disease had been removed. The men were well clothed, fed and sheltered. Their huts were properly drained and ventilated, and nuisances had been removed. The hard work had also ceased.

Compare, then, the right with the left-hand diagram from the months of September to April; and no more instructive lesson on army hygiène could be given. The men were the same, the conditions only had been altered. The requirements of nature had been disobeyed in every particular during the first winter, and she has left on that diagram an everlasting vindication of her broken laws. During the second winter, nature had been more perfectly obeyed, and the stigma of her displeasure has almost ceased to appear.

In discussing the causes of the terrible mortality of that fearful winter, we must not overlook another important point, namely, what chances a sick man had of proper care and treatment.

The medical staff, it is known, exerted itself to the very utmost, and incurred a large proportionate mortality among its members in consequence. But the accommodation for the sick in camp was for several months most defective. There were no proper hospitals, and no suitable beds or other appliances. The suffering from exposure among the sick was perhaps greater, considering their diseased state, than among the army generally.

The transport-ships were most defective at first, over-crowded and badly ventilated, and moreover, many cases were shipped in an unfit state for removal, particularly cases of choleraic disease. There was a great mortality on board the ships in consequence. During the period of 4½ months from the landing in the Crimea, to the end of January 1855, out of 13,093 sick shipped for Scutari, 976 died on a passage of only 300 miles, which is 75 per 1000. In January 1855, there were actually lost on the passage 10 to every 100 received alive. Of those who landed, two were lost out of every five treated in the Hospitals of the Bosphorus, during the month of February, and one out of every two at Koulali, the worst of all the Hospitals; for, when the sick arrived they were crowded into buildings which had undergone no sufficient sanitary preparation for their reception. The drainage, ventilation, lime-washing, and other arrangements were so defective that the buildings were little better than pest-houses, and the result was, an enormous and needless mortality among the sick, which went to swell the losses of the army, and to raise its proportionate rate of mortality.

The Scutari mortality was in fact a separate problem and must be considered by itself. It was the case of thousands of sick removed 300 miles from the causes which had occasioned their disease, and exposed to another class of risks in the buildings into which they were received. The buildings were spacious and magnificent in external appearance; far more so indeed than any military buildings in Great Britain; and several of them to all appearance were better suited for hospitals than any military hospitals at home.

The mere external appearance was, however, fatally deceptive. Underneath these great structures were sewers of the worst possible construction, loaded with filth, mere cesspools in fact, through which the wind blew sewer-air up the pipes of numerous open privies into the corridors and wards where the sick were lying.

The wards had no means of ventilation, the walls required constant lime-washing, and the number of sick placed in the hospitals during the winter was disproportionately large, especially when the bad sanitary state of the buildings is taken into consideration. The population of the hospitals was increased, not only without any sanitary precautions having been taken, but while the sanitary conditions were becoming daily worse, for the sewers were getting more and more dangerous, and the walls more and more saturated with organic matter. Some slight improvements were made in the beginning of March, 1855, but it was not till the 17th that effectual means were put into operation for removing the causes of disease in the buildings. By the end of June the improvements were nearly completed, and the proportion of sick had fallen off.

The small diagram (fig. 2) on Diagram K. shows the whole history of that frightful Scutari calamity. It exhibits the annual rate of mortality *per cent.* on the sick population of the hospitals. It will be observed that even from the very commencement of the occupation of these buildings in October, 1854, and before the sufferings of the winter had begun, the mortality was very high, although the number of sick was small, indicating the unhealthy state of the buildings from the very first. Nothing was done to improve them even then; only fresh ship loads of sick were passed into them. The mortality of course continued to advance. Still nothing was done. Then came the great Crimean catastrophe, and ship after ship arrived with sick in so susceptible a condition that the foul air of these hospitals was almost certain death to them, and accordingly, as the diagram shows, they died, in the month of February, at the rate of 415 per cent. per annum. In 12 months at such a rate the whole sick population of the hospitals would have perished four times.

Diagram K. Table K, fig. 2.

The reduction in the mortality after the sanitary works were begun is most striking, and it falls eventually in June 1855 to less than a sixth part of what it was when the Barrack and General Hospitals were occupied together in October, 1854, and to a nineteenth part of what it was in February 1855. Our General Hospitals have been so deplorably mis-managed in all our wars that the question has been raised as to whether it would not be better to do without them altogether The experience of Scutari, as shown on the diagram, proves that General Hospitals may become pest-houses from neglect, or may be made as healthy as any other buildings.

The question of these zymotic diseases is of infinitely greater importance during war than during peace, for no weapons are so destructive of armies in the field as they are. The slaughter of battles and sieges is cast into the shade by that of pestilence, which during long wars is the real arbiter of the destinies of nations, for it exhausts their resources more completely than all other losses in the field.

In a country like ours with a limited population, an entirely voluntary system of recruitment, and colonies and possessions in all climates and latitudes, the question of military hygiène is rapidly becoming a question of vital importance to the interests of the Empire. Upon the British race alone the integrity of that empire at this moment appears to depend. The conquering race must retain possession. Experience has shown that without special information and skilful application of the resources of science in preserving health, the drain on our home population must exhaust our means. The introduction, therefore, of a proper sanitary system into the British army is of essential importance to the public interests.

The Crimean experience has proved the whole case, both as regards the disastrous results of defective administrative arrangements, and the possibility of foreseeing and obviating similar evils in future.

And it has, moreover, shown that, with troops like ours, whose bravery and uncomplaining endurance of hardships the most severe and fatal, have been the admiration of the world, England has nothing to dread but the results of her own inexperience and want of foresight.

DIAGRAM Z.

Illustrative of the Quartermaster-General's Regulations for Encampments.

Diagram Z. Table Z.

Diagram Z is introduced to illustrate an important sanitary principle in camping troops, viz., the relative density of the population of a camp according to the number of tents pitched on a given area of ground.

The Quartermaster-General's "Regulations for Encampments" of 11th May, 1853, contain three plans for encamping a battalion 850 strong.

In plan No. 1, 60 tents are arranged in 10 lines of 6 tents to a line. Four of the lines are double, and there are two single lines.

Plan No. 2 shows a "compressed" order in which the tents are arranged in 10 double lines of three tents to a line.

Plan No. 3 has the tents arranged in 10 equidistant lines of six tents to a line.

Fifteen men are allotted by the regulations to each tent.

The occupied area in Plan No. 1, measured from the outer margin of the tents, is $210 \times 36 = 7560$ square yards.

In plan No. 2, it is $220 \times 18 = 3{,}960$ square yards.

In plan No. 3, the area occupied is the same as in No. 1, viz. 7,560 square yards.

In all the plans the areas given include the spaces between the tents, and they correspond to what are called the "built" and "unbuilt" areas in towns.

Plans Nos. 1 and 2 are so arranged that each double line of tents corresponds to the "built" area of a town, and the intervening spaces would represent the "unbuilt" area.

In plan No. 1 the area absolutely covered by two lines of tents, six in a line, and 2 yards between the lines is, yards $14 \times 36 = 504$ square yards.

In plan No. 2, six tents in two lines touching each other, cover a space = 12×18 216 square yards.

The following, on these data, would be about the population on the area of the camps reduced to a common unit :—

Plan No. 1 = 348,000 per square mile.
" " 2 = 664,000 " "
" " 3 = 347,000 " "

The occupied areas alone, without the open spaces intervening between the rows of tents are as follows :—

Plan No. 1 = 1,044,820 per square mile.
" " 2 = 1,290,000 " "

Sanitary principles of great importance are involved in the question of density of population upon a given area, and the whole subject has accordingly attracted considerable attention, more especially as it has been found that, other things being equal, the sickness and mortality among given populations bear a certain ratio to the density. The most densely peopled towns and districts are generally the most unhealthy. The prevailing diseases are fever, cholera, diarrhœa, consumption, and other diseases connected with atmospheric pollution. The air circulates less freely in densely populated districts, and the amount of organic refuse to be removed is, of course, much greater in proportion to the area where the population is more densely crowded than where such is not the case.

Enquiries into the density of town populations have shown that the densities vary from 10,000 or 12,000 inhabitants per square mile on the "built" and "unbuilt" area to 175,000 per square mile. In certain districts the population on the "built" area greatly exceeds these estimates.

Diagram Z shows the comparison between the density of population on the built and unbuilt area of the whole of London and on the Quartermaster-General's plans. Each point represents a human being; the angular spaces the area allotted to each in the different densities, and the blue lines the distance from person to person.

It will be seen that the least crowded of the Quartermaster-General's plans affords about a twentieth part of the area per man allotted to each inhabitant of the metropolis ; that it is about half the amount of that in the most densely peopled part of London ; and that the population on the *occupied area* of the camp is above 50 times more crowded than the population of London.

If the metropolitan area were equally crowded as the camp No. 3 on the diagram, it would contain 42,000,000 of people.*

If crowded as No. 2, it would contain 81,000,000.

And if the metropolis were as crowded as the occupied area shown in the diagram, it would hold 127,000,000 or about four times the population of the three kingdoms !

These comparisons will be sufficient to show the great importance of this element of overcrowding to the health of camps. A great part of the disease and mortality in towns is due to its operation, and there can be no doubt that in camps formed of unventilated tents and huts, and overcrowded to such extreme degrees of density, it is one of the most powerful operative causes of camp diseases.

It may be sometimes necessary in war to overcrowd camps, but it is evidently a measure only to be resorted to under pressing necessity, for camps can only be crowded by a considerable sacrifice of the force from disease.

* The number of square miles within the area of the metropolis is 121·92.

	Square Mile.	Persons.		Square Miles.	Persons.
Then as	1	347,000	::	121·92	42,000,000 nearly.

TABLES A and B, showing what would be the Mortality of the British Army if the rates were the same as those in (1) The Household Cavalry, (2) Dragoon Guards and Dragoons, (3) Infantry of the Line, (4) Foot Guards.

AGES.	Effectives of the British Army.	Deaths in the British Army at Home if the Mortality were the same as in—				
	Numbers living in 1851.	Household Cavalry.	Dragoon Guards and Dragoons.	Infantry of the Line.	Foot Guards.	Total of the British Army at Home.
Under 20 ..	11,911	90	99	157	133	146
20—25 ..	50,387	588	626	896	1087	858
25—30 ..	38,242	394	547	758	806	702
30—35 ..	22,099	293	326	438	431	406
35—40 ..	10,005	84	153	211	224	193
40 & upwards.	3,633	49	67	85	95	76
Total ..	136,277	1,498	1,818	2,545	2,776	2,381

	Rate of Mortality per 1,000.				
	Household Cavalry.	Dragoon Guards and Dragoons.	Infantry of the Line.	Foot Guards.	Total of the British Army at Home.
Total	11·0	13·3	18·7	20·4	17·5
Under 20	7·5	8·3	13·1	11·2	12·2
20—25	11·7	12·4	17·8	21·6	17·0
25—30	10·3	14·3	19·8	21·1	18·3
30—35	13·3	14·8	19·8	19·5	18·4
35—40	8·4	15·3	21·0	22·4	19·3
40 and upwards	13·4	18·3	23·4	26·2	21·0

The Annual Deaths among the 136.277 Effectives of the British Army at Home and Abroad, if the Mortality were the same as in the *Household Cavalry*, would be 1,498 ; in the *Dragoon Guards*, 1,818 ; in the *Infantry of the Line* 2,545 ; in the *Foot Guards* 2,776 ; and in the *Men of All Arms* in the British Service 2,381.

The Annual Rate of Mortality to 1,000 of the Household Cavalry is 11·0 ; of the Dragoon Guards 13·3 ; of the Infantry of the Line 18·7 ; of the Foot Guards 20·4 ; and of the Men of All Arms in the British Service at Home 17·5.

If the 136,277 soldiers had been subject to the rate of mortality which prevails in the healthiest districts of England, the annual deaths would have been 1,051 ; in one of the unhealthiest cities (Manchester) 1,688 ; and in all England 1,248.

NOTE—The numbers of men living in the British Army in 1851 were obtained from the Census Report of 1851. Vol. I. (Occupations) p. cccxlvi.

TABLE C.—*a.*

TABLE showing the AVERAGE STRENGTH, DEATHS, and Rate of MORTALITY in each Year, from 1839 to 1853, of the Officers, Non-commissioned Officers and Men, serving in the Army, at Home and Abroad, exclusive of Artillery, Royal Engineers, West India and Colonial Corps.

YEARS.	AVERAGE EFFECTIVE STRENGTH.		DEATHS.		ANNUAL MORTALITY TO 1,000 LIVING.		ANNUAL MORTALITY to 1,000 living of Men of the Soldiers' Ages, taken on Average of Five Years, 1849-53.	
	Officers, Non-Commissioned Officers and Men.	Officers.	Non-Commissioned Officers and Men.	Officers.	Officers, Non-Commissioned Officers and Men.	Officers.	In England and Wales.	In Healthy Districts.
1839	104,275	5,363	2,914	103	28·9	19·2	9·2	7·7
1840	112,922	5,383	3,300	85	30·0	15·8	9·2	7·7
1841	116,523	5,389	4,167	111	36·7	20·6	9·2	7·7
1842	120,576	5,390	5,052	138	43·0	25·6	9·2	7·7
1843	124,023	5,480	5,270	101	43·3	18·4	9·2	7·7
1844	124,826	5,492	3,867	77	31·6	14·0	9·2	7·7
1845	123,550	5,479	4,587	104	38·0	19·0	9·2	7·7
1846	126,282	5,588	5,125	118	41·5	21·1	9·2	7·7
1847	132,811	5,566	4,232	85	32·5	15·3	9·2	7·7
1848	133,493	5,512	3,213	95	24 8	17·2	9·2	7·7
1849	129,226	5,553	4,052	94	32·1	16·9	9·2	7·7
1850	124,657	5,546	3,119	70	25·6	12·6	9·2	7·7
1851	122,282	5,452	2,729	56	22·8	10·3	9·2	7·7
1852	124,083	5,460	3,120	74	25·7	13·6	9·2	7·7
1853	124,711	5,440	3,392	62	27·7	11·4	9·2	7·7
Total & Average, 1839–53 ..	1,844,130	82,093	58,139	1,373	32·3	16·7	9·2	7·7
	1,762,037		59,512		33·0			

The facts relative to the Army for this Table have been taken from a Return furnished by the Adjutant-General.—*July 6th*, 1857.

TABLE C—*b.*

NUMBER of DEATHS of NON-COMMISSIONED OFFICERS and MEN, showing also the Number of Deaths that would have occurred if the Mortality were 7·7 *per* 1,000, such as it was among Englishmen of the Soldier's Age in Healthy Districts, in the Years 1849–53, which fairly represented the Average Mortality.

YEARS.	*Deaths* that *would have occurred* in Healthy Districts among Males of the Soldier's Ages.*	Actual Deaths of Non commissioned Officers and Men.	Excess of Deaths among Non-commissioned Officers and Men.
1839	763	2,914	2,151
1840	829	3,300	2,471
1841	857	4,167	3,310
1842	888	5,052	4,164
1843	914	5,270	4,356
1844	920	3,867	2,947
1845	911	4,587	3,676
1846	930	5,125	4,195
1847	981	4,232	3,251
1848	987	3,213	2,226
1849	954	4,052	3,098
1850	919	3,119	2,200
1851	901	2,729	1,828
1852	915	3,120	2,205
1853	920	3,392	2,472
Total ..	13,589	58,139	44,550

The Table may be read thus:—In the year 1839 the number of deaths among non-commissioned officers and men was 2,914 out of the strength (98,912—see preceding Table); whereas the deaths among the *same number of men*, of the *same ages*, in the Healthy Districts of England, would have been only 763; consequently the excess of deaths, in the Army, amounted to 2,151.

* The exact Mortality among Englishmen of the Soldiers' ages, in the Healthy Districts, is ·0077122, the logarithm of which ($\bar{3}$·8871861) has been used in making this calculation.

TABLE D.

NUMBER of DEATHS of NON-COMMISSIONED OFFICERS and MEN, showing also the Number of Deaths that would have occurred if the Mortality were 9·2 per 1.000, such as it was among Men of the Soldier's Ages in England and Wales, in the Years 1849–53.

YEARS.	Deaths that would have occurred in England and Wales among Males of the Soldiers' Ages.	Deaths of Non-commissioned Officers and Men.	Excess of Deaths among Non-commissioned Officers and Men.
1839	910	2,914	2.004
1840	989	3,300	2,311
1841	1,022	4,167	3,145
1842	1,060	5,052	3,992
1843	1,091	5,270	4,179
1844	1.098	3.867	2,769
1845	1.086	4 587	3,501
1846	1,110	5,125	4.015
1847	1,171	4,232	3,061
1848	1,177	3,213	2,036
1849	1,138	4,052	2,914
1850	1,096	3,119	2.023
1851	1,075	2,729	1,654
1852	1,091	3.120	2.029
1853	1.097	3,392	2,295
Total ..	16,211	58,139	41,928

This Table may read thus:—In the year 1839 the number of deaths among non-commissioned officers and men was 2.914 out of the Strength (98,912—see preceding Table); whereas the deaths among the *same number of men*, of the *same ages*, living in England and Wales, would have been only 910! Consequently the excess of deaths in the Army amounted to 2,004.

TABLE E.—*a*.

(1) Two LIFE TABLES deduced from the Mortality of Soldiers in the English Army AT HOME (2) and from the Mortality of the Males of England at the same Age, 1849–53.

(*Facts relative to Soldiers, supplied by Sir A. Tulloch and Dr. Balfour's Report*, 1853, *p.* 31.)
Facts relative to Englishmen, supplied by the Registrar-General.

AGE.	English Soldiers Living.	Englishmen Living.	English Soldiers Dying Yearly.	Englishmen Dying Yearly.	Excess of Deaths among English Soldiers at Home.
20	10,000	10,000	169	82	87
21	9,831	9,918	168	83	85
22	9,663	9,835	166	84	82
23	9,497	9,751	164	85	79
24	9,333	9,666	162	86	76
25	9,171	9,580	160	87	73
26	9,011	9,493	159	88	71
27	8,852	9,405	158	89	69
28	8,694	9,316	157	91	66
29	8,537	9,225	155	91	64
30	8,382	9,134	153	93	60
31	8,229	9,041	150	94	56
32	8,079	8,947	147	95	52
33	7,932	8,852	145	97	48
34	7,787	8,755	144	97	47
35	7,643	8,658	144	99	45
36	7,499	8,559	143	101	42
37	7,356	8,458	141	102	39
38	7,215	8,356	138	103	35
39	7,077	8,253	135	106	29
40	6,942	8,147			

The Table enables you to follow 10,000 Soldiers, from the Age of 20 to the Age of 40; showing how many die in each year of age, and how many remain alive at the end of each year of age. Thus of 10,000 Soldiers alive at the exact age 20, 169 die in the next year of age, leaving alive 9,831 at the age 21.

For the sake of comparison, 10,000 of the male population of England are followed through the same ages. It will be noticed that of 10,000 soldiers, 7,077 live to the age 39, out of whom 135 die in the next year of age; whereas out of 10,000 men of all trades and occupations at the age 20, 8,253 attain the age of 39, and of these 106 die in the year of age following.

TABLE E.—*b*.

TABLE showing the Strength, Deaths, and Annual Rate of Mortality in the Household Brigade, and the Cavalry and Infantry of the Line, serving in the United Kingdom 1839–53; also showing what the Deaths would have been under more favourable circumstances.

Years.	Strength.	Deaths.	Annual Rate of Mortality per 1,000.	Number of Deaths that would have occurred if the Mortality had been the same as it was among the Males at corresponding ages		Excess of Deaths in Army at Home over the Deaths that would have occurred had the rate been Annually	
				In Healthy Districts.	In England and Wales.	7·7 per 1,000	9·2 per 1,000
1839	24,132	417	17·28	186	222	231	195
1840	19,159	321	16·75	148	176	173	145
1841	21,986	346	15·74	169	202	177	144
1842	23,019	360	15·64	177	212	183	148
1843	31,164	502	16·11	240	287	262	215
1844	37,265	635	17·04	287	343	348	292
1845	33,948	562	16·55	261	312	301	250
1846	30,280	577	19·06	233	279	344	298
1847	33,353	663	19·88	257	307	406	356
1848	37,766	629	16·66	291	347	338	282
1849	44,842	851	18·98	345	413	506	438
1850	36,794	479	13·02	283	339	196	140
1851	34,095	522	15·31	263	314	259	208
1852	35,067	469	13·37	270	323	199	146
1853	28,671	362	12·63	221	264	141	98
Total and Mean..	471,541	7,695	16·32	3,631	4,340	4,064	3,355

The facts for this Table have been taken for the Years 1839–44, from the Report (1853, pp. 5—16), of Sir A. Tulloch and Dr. Balfour; and from 1845 to 1853 from data supplied by Dr. Balfour. The Deaths from accident are included with the Deaths from disease. The other facts have been supplied to the Commission by the Adjutant-General.

F.—*a*.

TABLE showing, of 10,000 Recruits, at the Age 20, the Numbers remaining at each successive year of Age, up to 40, and also the Numbers annually eliminated by Invaliding or by Death.—It has been constructed from the facts supplied by the Army Reports and by the Paper of Dr. Balfour, on Invaliding. The principle of construction is the same as that employed at the General Register Office, in constructing Life Tables. It is assumed that the Soldiers enter the Service at the age of 20 years.

Age.	English Soldiers.				Completed Years of Service.
	Living.	Dying and Invalided.	Dying.	Invalided.	
20	10,000	350	169	181	0
21	9,650	325	168	157	1
22	9,325	305	166	139	2
23	9,020	289	164	125	3
24	8,731	278	162	116	4
25	8,453	270	160	110	5
26	8,183	265	159	106	6
27	7,918	264	158	106	7
28	7,654	263	157	106	8
29	7,391	266	155	111	9
30	7,125	271	153	118	10
31	6,854	275	150	125	11
32	6,579	282	147	135	12
33	6,297	288	145	143	13
34	6,009	296	144	152	14
35	5,713	302	144	158	15
36	5,411	307	143	164	16
37	5,104	313	141	172	17
38	4,791	315	138	177	18
39	4,476	318	135	183	19
40	4,158				

TABLE F.—*b*.

STRENGTH and Invaliding in the Army serving at Home, during the Years 1839—1853. (See Dr. Balfour's Paper).

Years Service.	Strength.				
	Household Cavalry.	Cavalry Line.	Foot Guards.	Infantry, Line.	All Arms.
All periods of Service ..	18,114	87,129	73,720	308,409	487,372
YEARS.					
0— 7	8,332	48,541	36,761	195,628	289,262
7—14	4,988	21,721	20,731	70,549	117,989
14—21 Infantry	—	—	12,707	39,097	51,804
14—24 Cavalry	4,188	15,453	—	—	19,641
21 and upwards Infantry ..	—	—	3,521	3,135	6,656
24 and upwards Cavalry	606	1,414	—	—	2,020
Invalided.					
All periods of Service ..	589	2,836	2,282	9,859	15,566
YEARS.					
0— 7	52	713	526	3,105	4,396
7—14	68	510	335	1,486	2,399
14—21 Infantry	—	—	254	2,174	2,428
14—24 Cavalry	147	568	—	—	715
21 and upwards Infantry ..	—	—	1,167	3,094	4,261
24 and upwards Cavalry ..	322	1,045	—	—	1,367

Proportion of Troops Invalided to 1,000 serving, at each period of Service, at Home.

All periods of Service	31·93
0— 7	15·19
7—14	20·34
14—21 } 24 }	43·98
21 and upwards } 24 ,, }	648·46

TABLE F.—*c*.

PROPORTION OF TROOPS, serving at Home, who DIED or were INVALIDED out of 1,000 serving in the Household Cavalry, Cavalry, and Infantry in three septennial periods of Service.

Ages.	Years of Service.	Deaths at Home.	Invalided at Home.	Invalided and Deaths
		to 1,000 Serving.		
20—27	0— 7	17·41	15·19	32·60
27—34	7—14	18·31	20·34	38·65
34—41	14—21 or 24	19·15	43·98	63·13

The Table may be read thus:—To 1,000 Troops who have served under 7 Years, of the Ages 20 and under 27, 17·41 DIE, 15·19 are INVALIDED, and 32·60 DIE OR ARE INVALIDED Annually.

NOTE.—Table F.—*a* was constructed from the facts in Tables F.—*b*. and F.—*c*.

F.—*d.*

TABLE showing the Number of Effectives (distinguishing Young Soldiers from Veterans) remaining (1) in the Army as it is; (2) in the Army in an Improved State—if the number of Annual Recruits were 10,000, and the Army served only at Home in a time of Peace.

——	Years of Service.	Ages.	To 10,000 Annual Recruits. Upon the above hypothesis.		Excess of Strength in the Army in an Improved State.
			Army in its present Sanitary State.	Army in an Improved State.	
Effectives	0—20	20—40	141,764	166,910	25,146
Young Soldiers	0—10	20—30	84,888	92,305	7,417
Veterans	10—20	30—40	56,876	74,605	17,729

The Table is intended to show more particularly the large number of Veterans lost to the Army as it is at present constituted:—Thus in the Army as it is, the number of Young Soldiers at the Ages 20—30 is 84,888, and of Veterans of the Ages 30—40 56,876, while in an improved state the numbers would be respectively 92,305 and 74,605, showing an addition to the strength of the Army of 7,417 Young Soldiers and 17,729 Veterans.

The number of Veterans actually in the Army, owing to Service in unhealthy stations abroad, is much less than in either of the above estimates; in 1851, of 120,733 men, 88,629 were of the Age 20—30, and only 32,104 were 30—40.

TABLE G.

DEATHS and ANNUAL RATE of MORTALITY per 1,000 Living, from all Causes, Zymotic Diseases, Chest and Tubercular Diseases, and all other Diseases, amongst the English Male Population Aged 15–45, (1848–54), and amongst the Infantry of the Line serving at Home (1837–46.)

CAUSES OF DEATH.	DEATHS.		Annual Rate of Mortality per 1,000 living.	
	Of Males aged 15 to 45, in England & Wales during the 7 Years 1848–54.	Infantry of the Line Serving at Home during the 10 Years 1837–46.	Of Males aged 15 to 45, in England & Wales during the 7 Years 1848–54.	Of Infantry of the Line Serving at Home during the 10 Years 1837–46.
ALL CAUSES	283,167	2,865	9·8	17·9
Zymotic Diseases	56,347	659	2·0	4·1
Chest and Tubercular Diseases	130,753	1,612	4·5	10·1
All other Diseases (including Violent Deaths) ..	96,067	594	3·3	3·7

Males aged 15–45 living in England and Wales in the middle of 1851	4,130,331
Aggregate Strength of Infantry of the Line (serving at Home) in 10 Years, 1837–46	160,103

NOTE.—The Deaths in England and Wales (1848–54) are taken from the 18th Annual Report of the Registrar-General, p. 150, and the Population (1851) from the Census Report, "Occupations," vol. I., p. clix. The Deaths and Aggregate Strength of the Infantry of the Line (1837–46) are taken from Sir A. Tulloch's Report on the Health of the Army for 1853, pp. 9, 62. At p. 9, in addition to the 2,683 deaths from disease (p. 62), are returned the particulars of 127 deaths by violence: leaving, however, 55 deaths unaccounted for. 2,683 + 127 + 55, make the above 2,865 deaths.

Bronchitis and influenza have no place in the Army nomenclature. The chronic catarrh of the Army Returns is believed to be really phthisis, in the great majority of cases; acute catarrh comprehends probably both epidemic catarrh, or influenza and bronchitis. The 55 deaths from acute catarrh have been treated as influenza and referred to zymotic diseases. The deaths from tubercular and chest diseases comprise scrofula, 24 (including apostema lumbare, 10; hydrarthrus, 1); phthisis, 1,241; hæmoptysis, 36; chronic catarrh, 135; hydrocephalus, 2; asthma, 2; dyspnea, 7; pleurisy, 10; pneumonia, 155. The zymotic diseases are, as far as the nomenclature allows, the same as those enumerated in the Registrar General's 16th Annual Report, pp. 83–5 of the Appendix.

TABLE H.—*a.*

MORTALITY in the ARMY of the EAST in Hospital during 2¼ years, from April 1st, 1854, to June 30th, 1856.

PERIOD.	Years of Life, or aggregate Strength.	Average Strength of the Army.	Deaths.	Annual Mortality per Cent.
April 1st, 1854, to June 30th, 1856, (2¼ years)	79,273	34,526	18,057	22·78

Note—The years of life and the average strength of the Army have been derived from the Weekly Return of the strength from April 1855, to May 1856, (inclusive), and for the previous period, April 1854, to March 1855, (inclusive), from the Return (A) of the Deaths during each Month, and from a Return of the Rate of Mortality during the same periods.

CLASS OF DISEASES.	Number of Deaths from Specified Causes.	Of the Total Deaths, the proportion per cent. from each Class.	Of the Total Deaths, (exclusive of violent Deaths), the proportion per cent. from each Class.	Deaths Annually, to 100 Living.
1 Zymotic	14,507	81·9	94·3	18·7
2 Constitutional ..	204	1·1	1·3	·3
3 Local	668	3·8	4·3	·9
4 Developmental	19	·1	·1	..
5 Violent	2,314	13·1	..	3·0

TABLE H.—*b*

ANNUAL RATE of MORTALITY per Cent., from different classes of disease, in Hospital in the Army of the East, and in the English Male Population of the Ages 15–45.

CLASS OF DISEASES.	DEATHS ANNUALLY, TO 100 LIVING.	
	In the Army of the East.	English Male Population, 15–45 (1848–54).
1 Zymotic Diseases	18·7	·20
2 Constitutional Diseases	·3	·42
3 Local Diseases	·9	·26
4 Developmental Diseases	..	..
5 Violent Deaths	3·0	·10
All Causes	22·9	·98

TABLE K.—Figure 1.

TABLE SHOWING the ESTIMATED AVERAGE MONTHLY STRENGTH of the ARMY; and the Deaths and Annual Rate of Mortality per 1,000, in each Month, from April, 1854, to March, 1856, (inclusive), in the Hospitals of the Army in the East.

Months	Estimated Average Monthly Strength of the Army.	Deaths.			Annual Rate of Mortality per 1,000.		
		Zymotic Diseases.	Wounds and Injuries.	All other Causes.	Zymotic Diseases.	Wounds and Injuries.	All other Causes.
1854 April	8,571	1	..	5	1·4	..	7·0
May	23,333	12	..	9	6·2	..	4·6
June	28,333	11	..	6	4·7	..	2·5
July	28,722	359	..	23	150·0	..	9·6
August	30,246	828	1	30	328·5	·4	11·9
September ..	30,290	788	81	70	312·2	32·1	27·7
October	30,643	503	132	128	197·0	51·7	50·1
November ..	29,736	844	287	106	340·6	115·8	42·8
December ..	32,779	1,725	114	131	631·5	41·7	48·0
1855 January	32,393	2,761	83	324	1022·8	30·7	120·0
February	30,919	2,120	42	361	822·8	16·3	140·1
March	30,107	1,205	32	172	480·3	12·8	68·6
April	32,252	477	48	57	177·5	17·9	21·2
May	35,473	508	49	37	171·8	16.6	12·5
June	38,863	802	209	31	247·6	64·5	9·6
July	42,647	382	134	33	107·5	37·7	9·3
August	44,614	483	164	25	129·9	44·1	6·7
September ..	47,751	189	276	20	47·5	69·4	5 0
October	46,852	128	53	18	32·8	13·6	4·6
November ..	37,853	178	33	32	56·4	10·5	10·1
December ..	43.217	91	18	28	25·3	5·0	7·8
1856 January	41,212	42	2	48	11·4	·5	13·0
February	43,485	24	..	19	6·6	..	5·2
March	46,140	15	..	35	3·9	..	9·1

The Deaths under the head of "Wounds and Injuries," comprise the following causes:—Luxatio, Sub-Luxatio, Vulnus Sclopitorum, Vulnus Incisum, Contusio, Fractura, Ambustio, and Concussio Cerebri.

TABLE K.—Figure 2.

ANNUAL RATE of MORTALITY per Cent., on Sick Population at SCUTARI, from October 1st, 1854, to June 30th, 1855.

	Annual Rate of Mortality per *Cent.*
1854 October 1st to October 14th ..	148
October 15th — November 11th ..	101
November 12th — December 9th ..	121
December 10th — January 6th ..	202
1855 January 7th — January 31st ..	319
February 1st — February 28th ..	415
February 25th — March 17th ..	235
March 18th — April 7th ..	125
April 8th — April 28th ..	79
April 29th — May 19th ..	60
May 20th — June 9th ..	56
June 10th — June 30th ..	34

GENERAL RETURN Showing the Primary Admissions into the Hospitals of the Army in the East, from the 10th April, 1854, to the 30th June, 1856; also the Deaths from Primary as well as Secondary Admissions, together with those occurring on board Transports, conveying Sick and Wounded, during the same period.—Arranged According to the Classificatian of Causes of Death proposed by Dr. Farr, in the 16th Annual Report of the Registrar-General, pp. 82—96, so far as this is practicable under the imperfect system of nomenclature in use.

Class.	Causes of Death.	Admissions.	Deaths.
	ALL CAUSES	162,123	18,057
	SPECIFIED CAUSES ...	161,297	17,712
	DISEASES:—		
I.	ZYMOTIC	112,651	14,507
II.	CONSTITUTIONAL ...	828	204
III.	LOCAL	25,043	668
IV.	DEVELOPMENTAL ...	214	19
V.	VIOLENT	22,561	2,314
	ORDERS.		
I.	1. MIASMATIC	108,577	14,503
	2. ENTHETIC	3,748	4
	3. DIETIC (included in Order I.) ...	—	—
	4. PARASITIC	326	—
II.	1. DIATHETIC	458	84
	2. TUBERCULAR	370	120
	ORDER 1.		
I.	Smallpox	21	4
	Measles	5	2
	Scarlatina	3	—
	Quinsey	924	9
	Erysipelas	78	21
	Phlebitis	3	—
	Typhus (and continued Fever)	25,841	3,075
	Carbuncle	—*	—*
	Influenza	9,506	144
	Dysentery	8,278	2,259
	Diarrhœa	44,164	3,651
	Cholera	6,970	4,512
	Ague	2,406	60
	Remittent Fever	2,957	311
	Rheumatism (Acute and Chronic)	5,044	233
	ORDER 2.		
I.	Syphilis	3,748	4
	Hydrophobia	—*	—*
	ORDER 3.		
I.	Privation	?*	?*
	Purpura and Scurvy (see above under Dysentery)	2,096	178
	Alcoholism (includes only Delirium Tremens, other cases not returned)	281	44
	ORDER 4.		
I.	Scabies	257	—
	Worms	68	—
	Dracunnculus	1	—
	ORDER 1.		
II.	Gout	—*	—*
	Dropsy	294	63
	Cancer et Tumores ...	62	1
	Mortification	79	20
	Cachexia	23	—
	ORDER 2.		
II.	Scrofula	90	3
	Phthisis	279	116
	Hydrocephalus	1	1

Class.	Causes of Death.	Admissions.	Deaths.
III.	Diseases of the:—		
	1. NERVOUS SYSTEM ...	4,051	117
	2. ORGANS of CIRCULATION	263	41
	3. RESPIRATORY ORGANS ...	2,607	384
	4. DIGESTIVE ORGANS ...	4,592	84
	5. URINARY ORGANS ...	239	6
	6. ORGANS of GENERATION	—	—
	7. ORGANS of LOCOMOTION	129	1
	8. INTEGUMENTARY SYSTEM	13,162	35
IV.	1—3. Not occurring in the Army.	—	—
	4. DISEASES of NUTRITION	214	19
V.	1. ACCIDENT	2,484	532
	2. BATTLE...	18,283	1,761
	3. HOMICIDE	—	—
	4. SUICIDE	20	20
	5. PUNISHMENT and EXECUTION.. ...	1,774	1
	Causes not Specified ...	826	345
III.	ORDER 1.		
	Cephalitis	11	7
	Apoplexy	87	70
	Paralysis	42	10
	Insanity (Dementia) ...	44	4
	Epilepsy	261	17
	Tetanus	10	8
	Cephalalgia	128	—
	Neuralgia	28	—
	Ophthalmitis	3,307	—
	Otitis	133	1
III.	Order 2.		
	Pericarditis	24	4
	Aneurism	9	8
	Heart Disease	127	29
	Varix	58	—
	Palpitatio	45	—
III.	Order 3.		
	Epistaxis	10	—
	Laryngitis	—*	—*
	Bronchitis	1,688	199
	Pleurisy	264	23
	Pneumonia	590	161
	Asthma and Dyspnœa ...	55	1
	Other Lung Diseases . .	—	—
III.	Order 4.		
	Gastritis	29	8
	Enteritis	36	11
	Peritonitis	16	9
	Ascites	—*	—*
	Ulceration of Intestines ...	—*	—*
	Hernia	101	2
	Ileus et Constipatio ...	1,862	5
	Intussusception	1	1
	Stricture of Intestines ...	—*	—*
	Fistula	129	3
	Dyspepsia	906	3
	Hæmorrhois	358	—
	Hæmatemesis	15	2
	Singultus	1	—
	Pancreas	—*	—*
	Hepatitis	251	17
	Jaundice	878	22
	Other Liver Diseases ...	—*	—*
	Spleen Disease	9	1

* No admissions or deaths were returned under any of these heads.

Class.	Causes of Death.	Admissions.	Deaths.
III.	Order 5.		
	Nephritis (and Nephria) ...	26	2
	Ischuria	39	—
	Nephria (see above) ...	—	—
	Diabetes	8	1
	Stone	—*	—*
	Hæmaturia	1	—
	Cystitis	9	1
	Stricture of Urethra ...	139	2
	Hydrocele	15	—
	Varicocele	2	—
III.	Order 6. (Not applicable to the Army.)	—	—
III.	Order 7.		
	Arthritis	87	—
	Ostitis and Periostitis ...	7	—
	Joint Disease	25	1
	Exostosis	2	—
	Necrosis, Caries, &c. ...	8	—
III.	Order 8.		
	Phlegmon	8,323	23
	Ulcer	4,090	11
	Skin Diseases	749	1
IV.	Orders 1—3. (Not applicable to the Army.)	—	—
IV.	Order 4.		
	Atrophy and Debility ...	214	19
V.	Order 1.		
	Gelatio (Frostbite) ...	2,389	463
	Pernio (Chilblain) ...	9	—
	Sunstroke	13	2
	Asphyxia	2	2
	Poisoning	6	—
	Other violent Deaths† ...	65	65
V.	Order 2. (It is not stated that all these wounds and injuries were incurred in fighting, but, there being no means of distinction, they have all been referred to this Order.)		
	Luxatio	80	1
	Subluxatio...	1,453	1
	Vulnus Sclopitorum ...	10,691	1,706
	,, Incisum	1,270	18
	Contusio	4,006	21
	Fractura	380	14
	Ambustio	399	—
	Concussio Cerebri... ..	4	—
V.	Order 3.		
	Homicide	—*	—*
V.	Order 4.		
	Suicide‡	20	20
V.	Order 5.		
	Execution	1§	1§
	Punishment	1,773	—
	Causes not Specified ...	826	345

* No admissions or deaths were returned under any of these heads.
† These are not properly returned, but appear under the collective head of "Accidental, Sudden, Ebrietas, and Cold," &c.
‡ Unsuccessful attempts at suicide were, apparently, not recorded.
§ This case was returned simply as hanging.
Note.—The names of certain Orders as well as those of certain specific Diseases are omitted, as not applicable to the Army.

Table Z.

DENSITY OF POPULATION.

A few Districts of Great Density—consisting of Built Area and Streets.

Districts and Towns.	Persons to a Square Mile, 1841-50.*
East London	175,816
Strand	161,556
St. Luke	151,104
Holborn	148,705
St. James', Westminster	144,008
Liverpool	69,368
Birmingham	37,554
Leeds	28,965
Bristol	22,606
Nottingham	19,082
East Stonehouse	18,028
London	17,678
Plymouth	17,368
Hull	16,082
Manchester	10,664

Quarter-Master General's Plans for Encampments.

No. 2	Occupied and Unoccupied Area.	664,000
No. 1		348,000
No. 3		347,000
Occupied Area		1,044,820

* The number of persons to a square mile in the districts and towns of England, calculated on the mean population of 1841 and 1851, has been taken from the Registrar-General's Sixteenth Annual Report, Supplemental Tables, pp. 150—153.

(A.)

Lines

Representing the Relative Mortality of the **Foot Guards** *and of the* **English Male Population** *at corresponding Ages.*

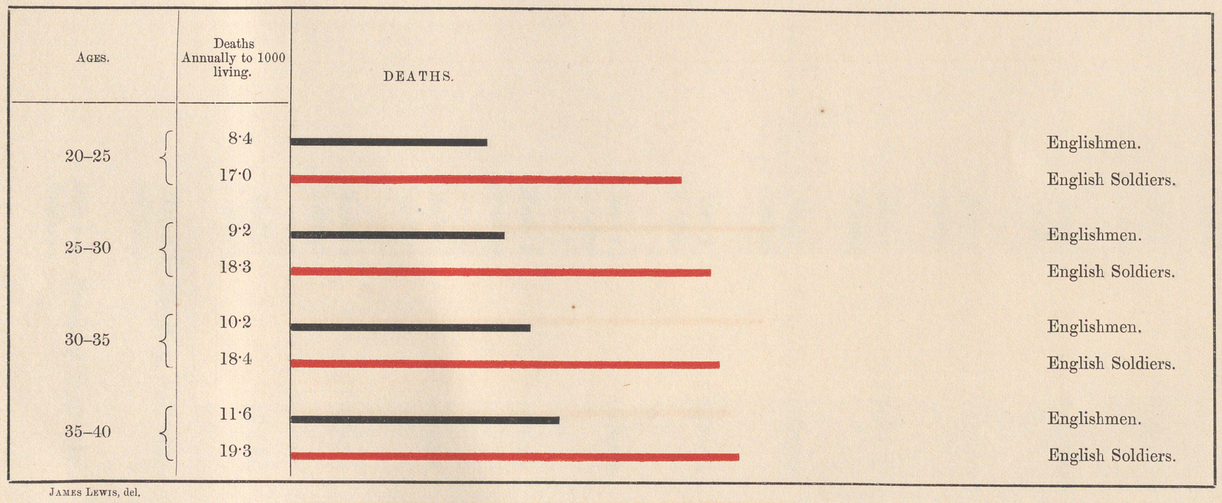
James Lewis, del., General Register Office, Somerset House.

Note.—The Mortality of the English Male Population, at the above ages, is taken from English Life Table (1849–53).

(B.)

Lines

Representing the Relative Mortality of the **Army at Home** *and of the* **English Male Population** *at corresponding Ages.*



James Lewis, del.

Note.—The Mortality of the English Male Population, at the above ages, is taken from English Life Table (1849–53).

of the Non-Commissioned Officers and Men
and Colonial Corps, 1839 – 1853.

.....	Males in Healthy Districts
.....	Soldiers
.....	Males in Healthy Districts
.....	Soldiers
.....	Males in Healthy Districts
.....	Soldiers
.....	Males in Healthy Districts
.....	Soldiers
.....	Males in Healthy Districts
.....	Soldiers
.....	Males in Healthy Districts
.....	Soldiers
.....	Males in Healthy Districts
.....	Soldiers
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.....	Soldiers
.....	Males in Healthy Districts
.....	Soldiers
.....	Males in Healthy Districts
.....	Soldiers
.....	Males in Healthy Districts
.....	Soldiers
.....	Males in Healthy Districts
.....	Soldiers

Ar
183

F. J. W

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s represented as uniform in each of the years given in the Diagram.

(C.)

DIAGRAM - representing the relative Mortality of Males of the Soldiers Ages living in Healthy Districts; and of the Non-Commissioned Officers and Men serving in the Army abroad and at home exclusive of Artillery, Royal Engineers, West India, and Colonial Corps, 1839 – 1853.

Years	Annual Rate of Mortality per 1000	DEATHS
1839	7·7	Males in Healthy Districts
	29·5	Soldiers
1840	7·7	Males in Healthy Districts
	30·7	Soldiers
1841	7·7	Males in Healthy Districts
	37·5	Soldiers
1842	7·7	Males in Healthy Districts
	43·9	Soldiers
1843	7·7	Males in Healthy Districts
	44·5	Soldiers
1844	7·7	Males in Healthy Districts
	32·4	Soldiers
1845	7·7	Males in Healthy Districts
	38·8	Soldiers
1846	7·7	Males in Healthy Districts
	42·5	Soldiers
1847	7·7	Males in Healthy Districts
	33·3	Soldiers
1848	7·7	Males in Healthy Districts
	25·1	Soldiers
1849	7·7	Males in Healthy Districts
	32·8	Soldiers
1850	7·7	Males in Healthy Districts
	26·2	Soldiers
1851	7·7	Males in Healthy Districts
	23·4	Soldiers
1852	7·7	Males in Healthy Districts
	26·3	Soldiers
1853	7·7	Males in Healthy Districts
	28·4	Soldiers
Average 1839–53	7·7	Males in Healthy Districts
	33·0	Soldiers

F. J. Williams del. General Register Office

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NOTE. The Mortality of Males in the Healthy Districts is based on an average of 5 Years and in this view is represented as uniform in each of the years given in the Diagram

D l Wales; and of the Non-Commissioned
, and Colonial Corps, 1839 – 1853.

Y	
1	Males in England & Wales
	Soldiers
1	Males in England & Wales
	Soldiers
1	Males in England & Wales
	Soldiers
1	Males in England & Wales
	Soldiers
1	Males in England & Wales
	Soldiers
1	Males in England & Wales
	Soldiers
1	Males in England & Wales
	Soldiers
1	Males in England & Wales
	Soldiers
1	Males in England & Wales
	Soldiers
1	Males in England & Wales
	Soldiers
1	Males in England & Wales
	Soldiers
1	Males in England & Wales
	Soldiers
1	Males in England & Wales
	Soldiers
1	Males in England & Wales
	Soldiers
A	Males in England & Wales
18	Soldiers

F. J. Willis

NO of the Soldiers Ages in England and Wales.

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(D.)

DIAGRAM,—representing the relative Mortality of Males of the Soldiers Ages living in England and Wales; and of the Non-Commissioned Officers and Men serving in the Army, exclusive of Artillery, Royal Engineers, West India, and Colonial Corps, 1839–1853.

F. J. Williams, del. General Register Office.

NOTE. The Mortality of Males is based on an Average of 5 Years and in this view is represented as uniform in each of the years given in the Diagram of the Soldiers Ages in England and Wales.

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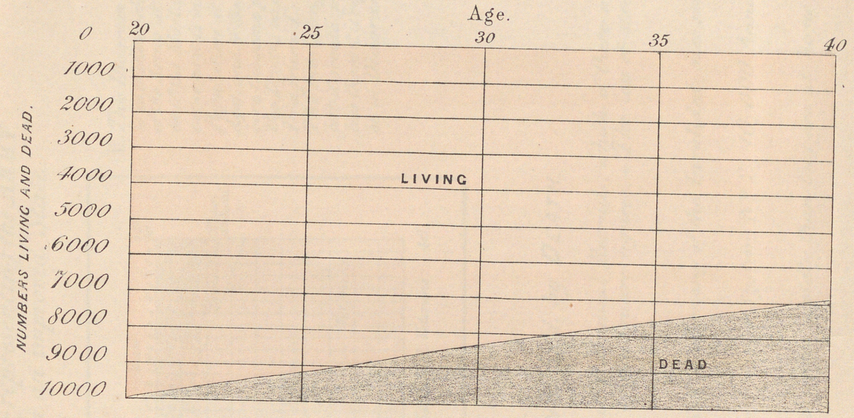
(E.)

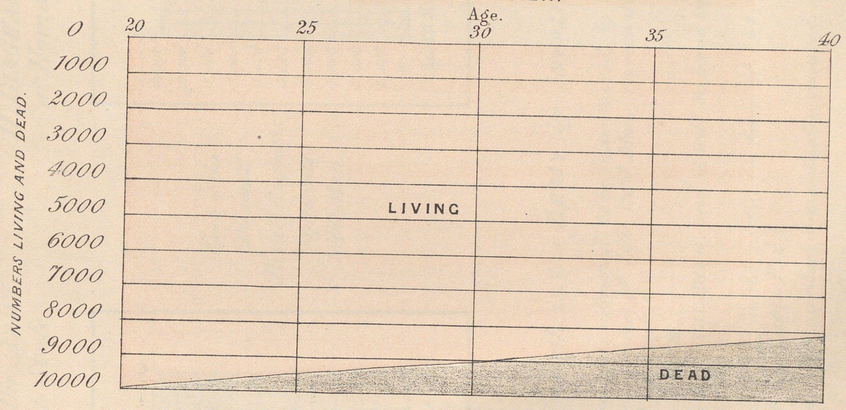
DIAGRAM

Showing the Numbers Living and Dead at the several Ages from 20—40.

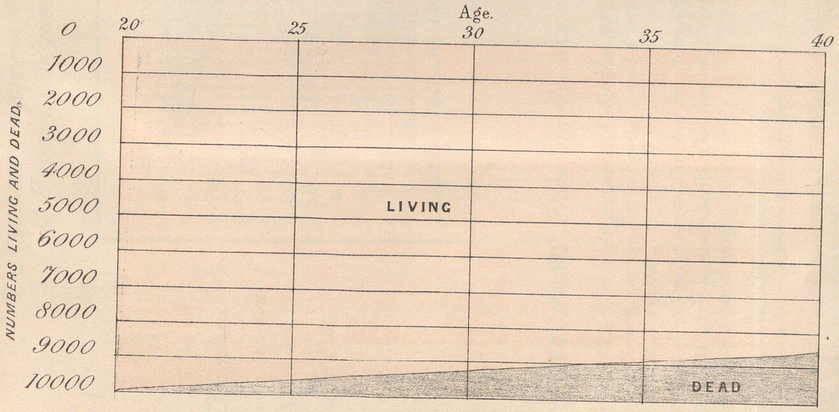
1. ENGLISH SOLDIERS.



2. ENGLISHMEN.



3. ENGLISHMEN IN HEALTHY DISTRICTS.



Thus:—the Diagram (1) shows that out of 10,000 Soldiers alive at the Age of 20, about 7000 are living and 3000 are dead at the Age 40.

E. Williams del. General Register Office.

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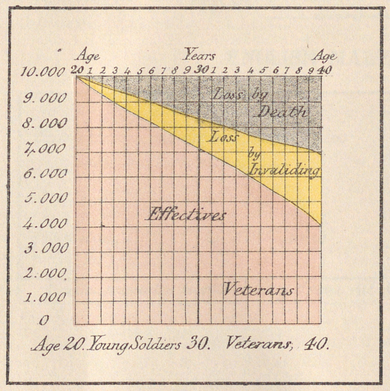
F.

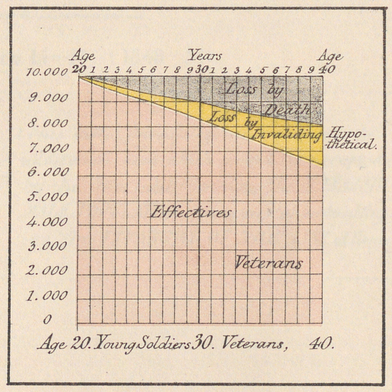
I. DIAGRAM – representing the ARMY at Home in its present State.

II. DIAGRAM – representing the ARMY at Home in an improved State.

I. *This Diagram has been constructed to illustrate Table F. a.*



Each of the 200 small Parallelograms represents 1000 Men.



II. *This Diagram is constructed so as to show what the State of the Army at Home would be if the Mortality were the same as it is in the Civil Population at corresponding Ages, and if the Invaliding bore the same proportion to the Deaths as it does in Diagram I. The Invaliding may be more, but it would probably be less than it is represented to be in Diagram II.*

TWO DIAGRAMS *showing the loss of strength in the* **ARMY** *by* **INVALIDING** *and by* **DEATH.**

The force 141, 764 (represented by the **RED** *Area,) is assumed to be maintained by 10, 000 Annual Recruits, which if there were no loss by Death, or by Invaliding would sustain a force of 200, 000 Men, represented by the Square figures, – The loss of strength shown in Diagram I is equal to 58, 237 = 29 per Cent.*

The **DARK** *Area represents the loss of strength by* **DEATH**.

The **YELLOW** *Area represents the loss of strength by* **INVALIDING**, *and it will be borne in mind that many of the Invalided die soon after leaving the Army.*

NOTE. *10, 000 Annual Recruits under System Nº I, would sustain a force of 141, 764; under System Nº 2, 10, 000 Annual Recruits would sustain a force of 166, 910. (See Table F. d.)*

Owing to Service abroad in unhealthy Stations, the numbers are actually reduced much more rapidly than they are at home, as shown in Diagram I.

F.G. Williams del. General Register Office, Somerset House.

Harrison & Sons, lith.: St Martins Lane, London.

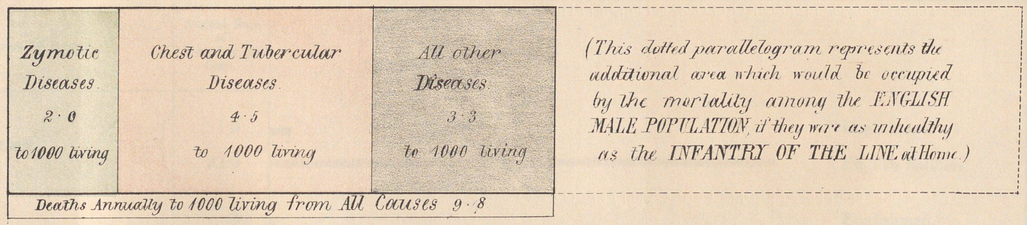
(G.)

DIAGRAMS

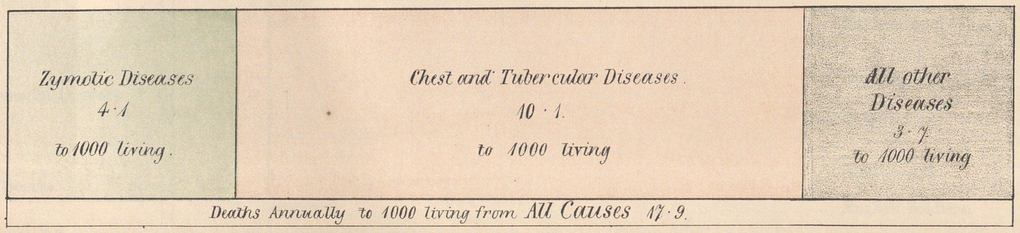
(to illustrate Table G.)

representing the relative Annual Mortality from ALL CAUSES, ZYMOTIC DISEASES, CHEST and TUBERCULAR DISEASES, and OTHER DISEASES, in the ENGLISH MALE POPULATION aged 15–45, and in the INFANTRY OF THE LINE serving at Home.

ENGLISH MALE POPULATION AGED 15–45. (1848–54).



INFANTRY OF THE LINE (SERVING AT HOME) (1837–46).



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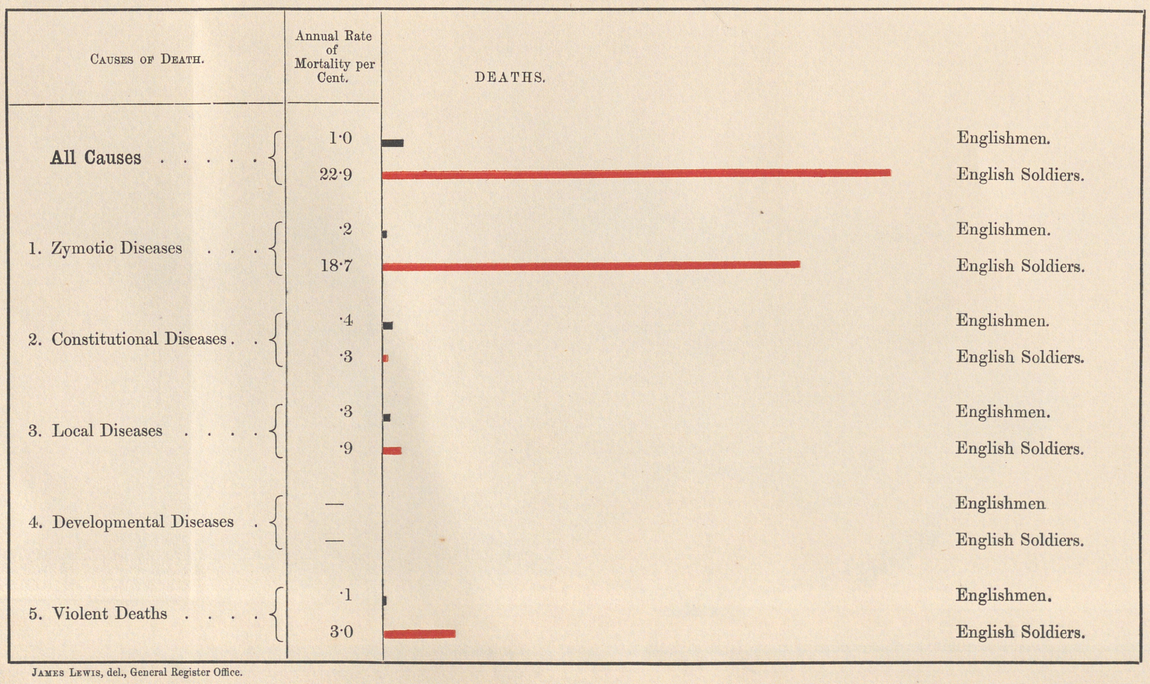
(H.)

Lines

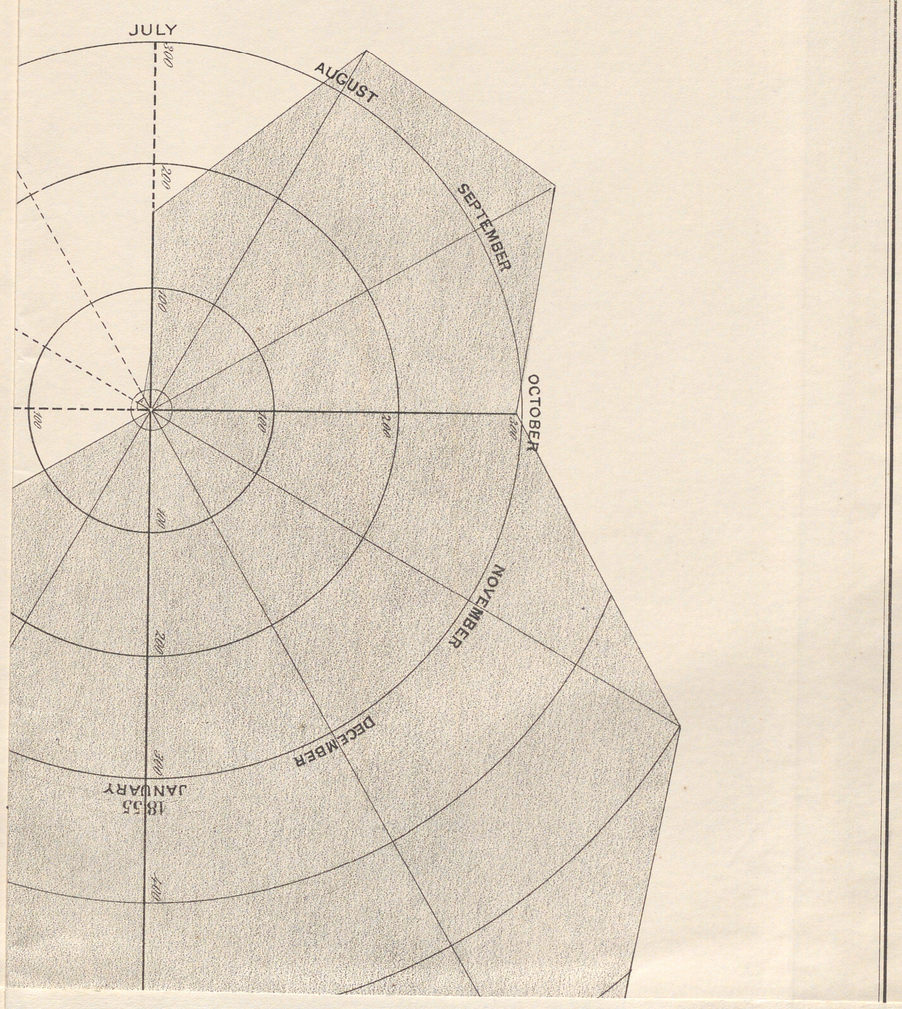
Representing the Relative Mortality, from different Causes, of the **Army in the East in Hospital** *and of the* **English Male Population** *aged* 15—45.



James Lewis, del., General Register Office.

All the lines on this Diagram would require to be lengthened Tenfold to be on the same scale as the lines on Diagrams A and B.

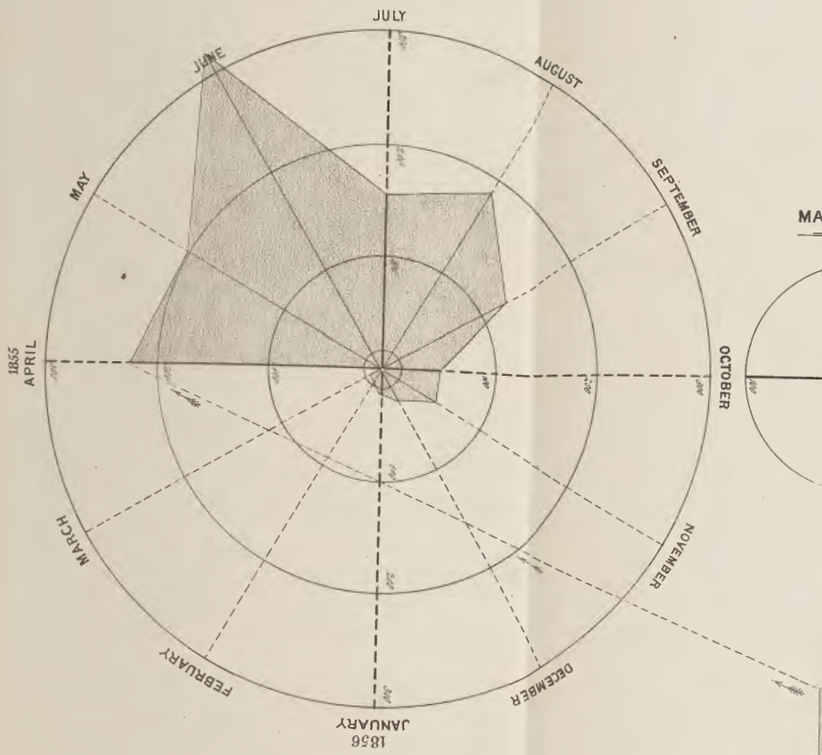
APRIL 1854 TO MARH 1855



(I.)

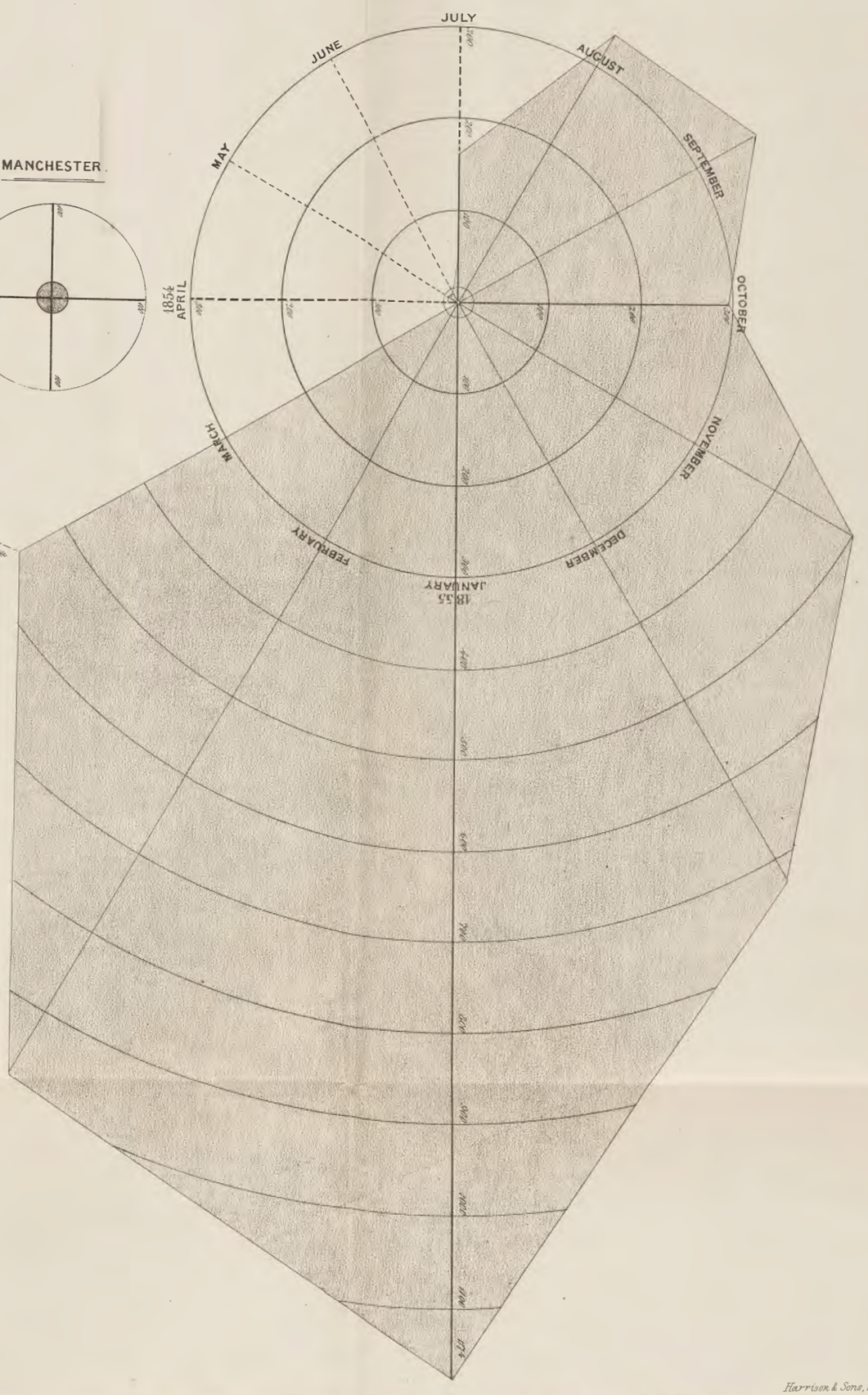
ARMY IN THE EAST.

APRIL 1855 TO MARCH 1856



MANCHESTER.

APRIL 1854 TO MARH 1855



EXPLANATION.

The Diagrams represent the ANNUAL RATE of Mortality per 1000 in the Hospitals of the Army in the East for each Month from April 1854 to March 1856

The inner circle shows the Mortality which the Army would have experienced if it had been subject to the same rate which prevailed in one of the unhealthiest Cities of England (Manchester).— The distances between the Centre and the second, the second and the third circles &c. each represent 100 deaths to 1000 living.— The Annual rate of Mortality in any particular Month is shown by the length of the radial line extending from the centre in the direction of the Month indicated on the outer circle.

Thus:— In January 1855 the Annual rate of Mortality per 1000 was 1174: a higher rate than that which prevailed during the Month (September) when the Mortality was highest in the year of the Great Plague, 1665.

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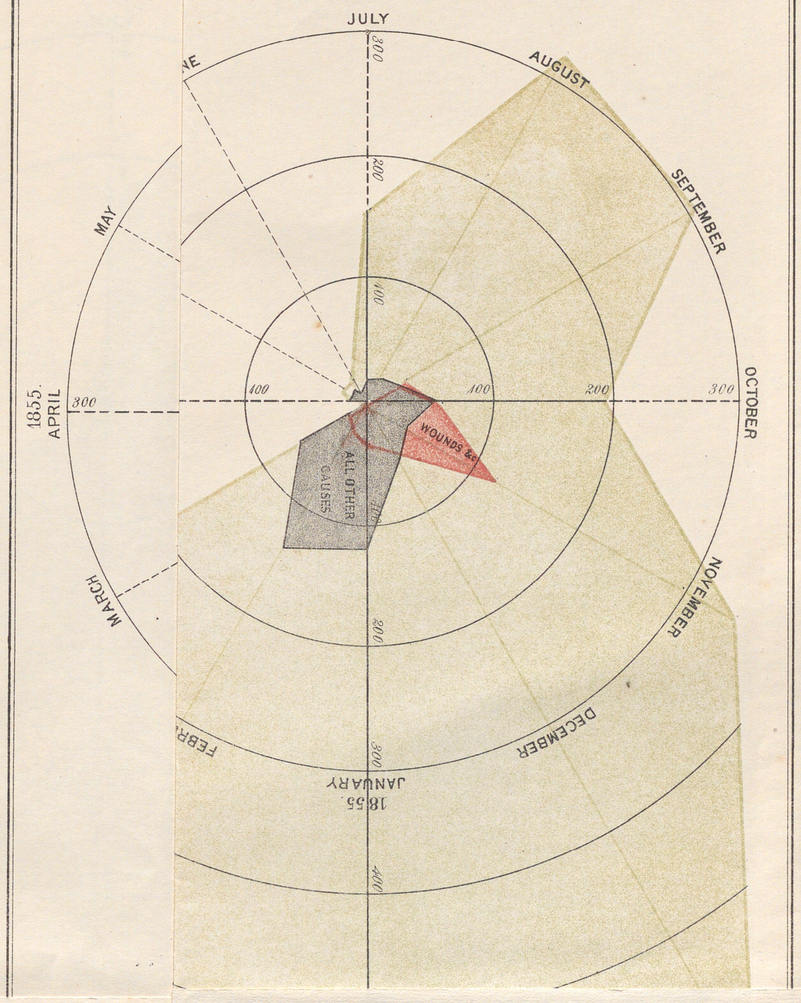
AUSES (black),—

APRIL 1854 TO MARCH 1855.



(K.)

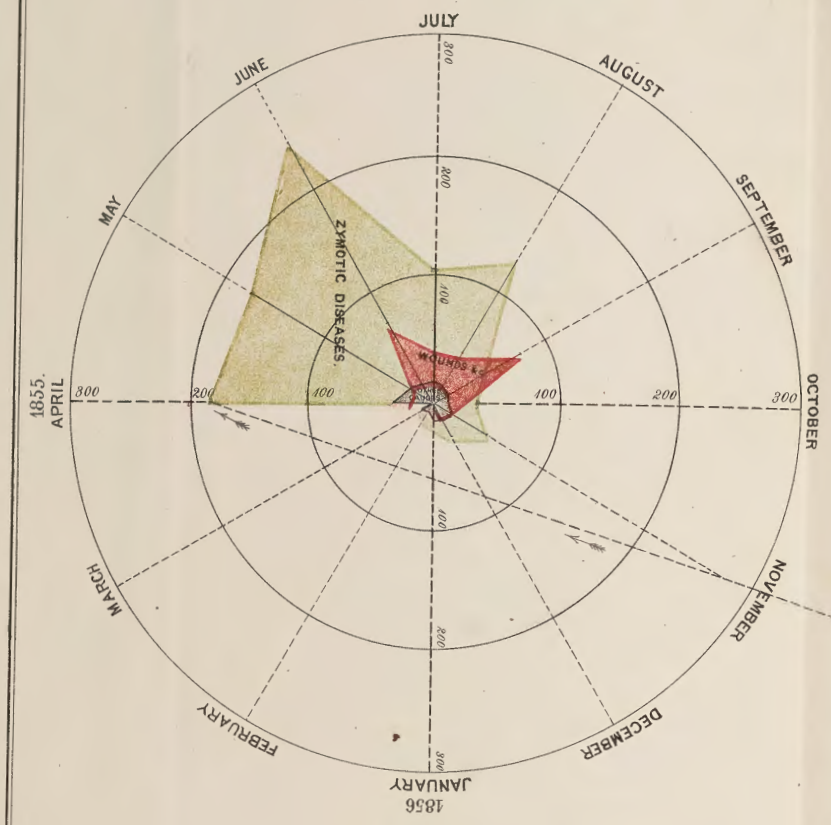
DIAGRAMS

representing the relative Mortality from ZYMOTIC DISEASES (blue); from WOUNDS &c. (red); and from ALL OTHER CAUSES (black),—

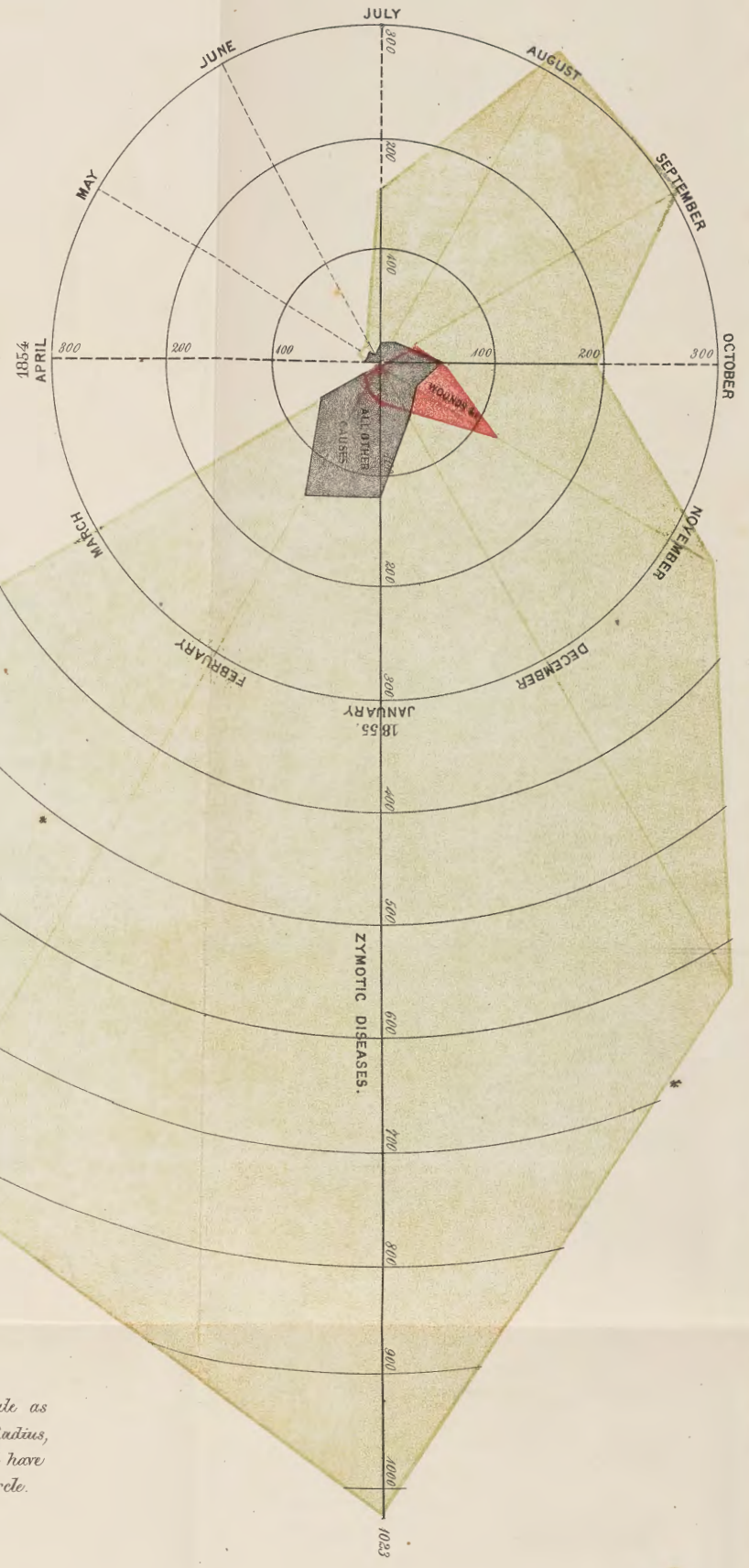
IN THE HOSPITALS OF THE ARMY IN THE EAST,

FOR EACH MONTH FROM APRIL 1854 TO MARCH 1856.

APRIL 1855 TO MARCH 1856.



APRIL 1854 TO MARCH 1855.



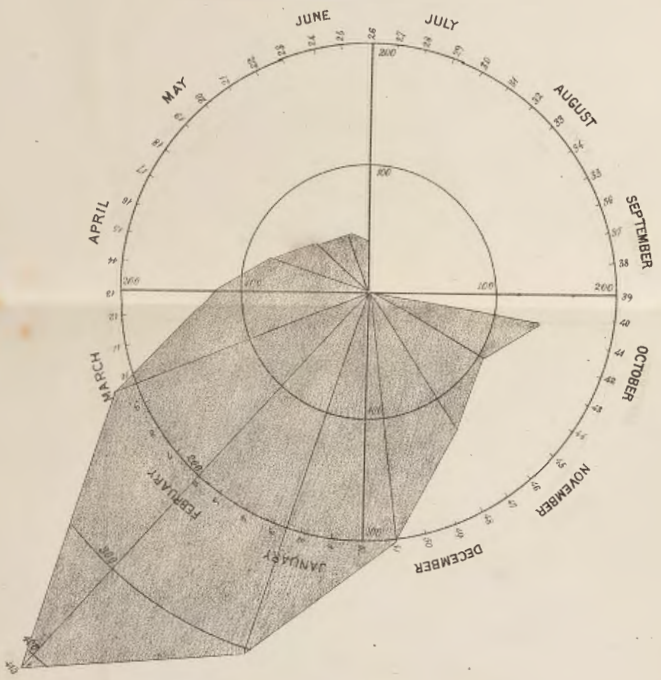
DIAGRAM

showing the Annual Rate of Mortality Per Cent, on the

SICK POPULATION AT SCUTARI,

FROM OCTOBER 1ST 1854 TO JUNE 30TH 1855.

Fig. 2.



Had Fig. 2 been projected on the same Scale as the other Figures on this Sheet, the longest Radius, showing the Mortality in February, would have projected 40 inches from the Centre of the Circle.

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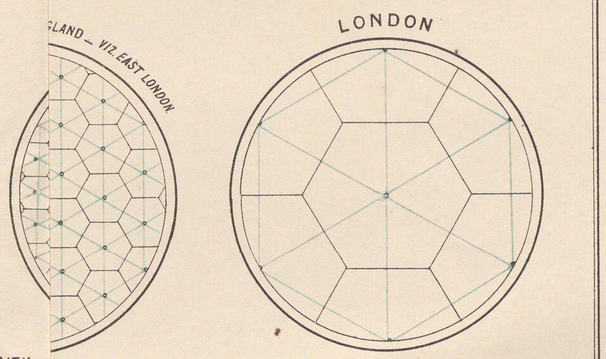
DIAG

1851.



DENSITY
PROXIMITY

to a person
son to person.
160 · 0. Square Yds. to a person
14 · 2 Yds. from person to person.

ent the average amount of ground to each
n to person, including the space occupied by the body.

F. J. Williams

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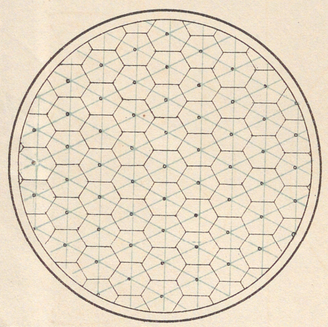
DIAGRAMS CONSTRUCTED ON THE DATA FURNISHED BY THE QUARTER MASTER GENERALS PLANS FOR ENCAMPMENT.

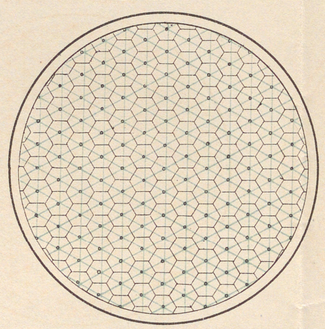
OCCUPIED & UNOCCUPIED AREA.

N° 3.



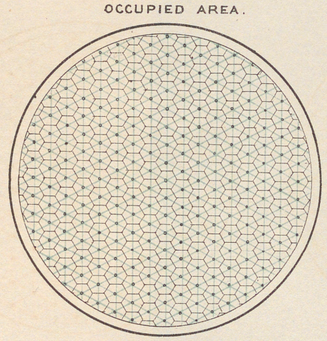
DENSITY *8·9 Square Yds. to a Person*
PROXIMITY *or distance from Person to Person 3·2 Yds*
including the space occupied by the body

N° 2.



4·7. Square Yds. to a person.
2·3. Yds. from person to person.

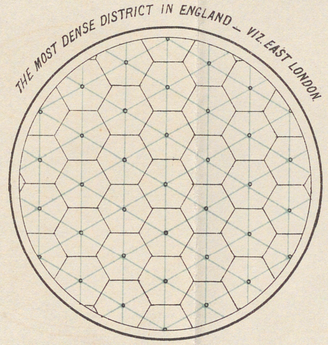
OCCUPIED AREA.



3·0 Square Yds. to a person.
1·9. Yds. from person to person.

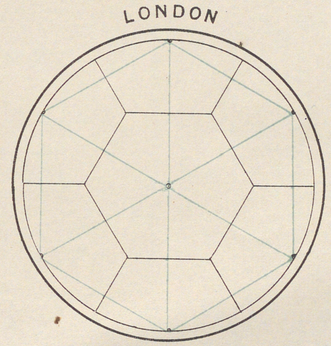
1851.

THE MOST DENSE DISTRICT IN ENGLAND — VIZ. EAST LONDON



17·6. Square Yds. to a person.
4·5. Yds. from person to person.

LONDON



160·0. Square Yds. to a person.
14·2 Yds from person to person.

The Number of Points (·) represents the Density of the Population; the six sided Figures represent the average amount of ground to each person and the blue lines from point to point indicate the Proximity or mean distance from person to person, including the space occupied by the body.

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